AFGWC TECHNICAL MEMORANDUM 70-6

AFGWC AUTOMATED METEOROLOGICAL DATA PROCESSING

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15 SEPTEMBER 1970

PUBLISHED BY
AIR FORCE GLOBAL WEATHER CENTRAL
AIR WEATHER SERVICE (MAC)
OFFUTT AFB NEBR. 68113

AFGWC TECHNICAL MEMORANDA

The Air Force Global Weather Central (AFGWC) is an operational unit of Headquarters, Air Weather Service (AWS), a sub-command of the Military Airlift Command (MAC). The AFGWC provides environmental data to the USAF, the U.S. Army, and other selected DoD units. These memoranda are brief descriptions of techniques developed by AFGWC personnel to meet military requirements. They provide detailed information on the scientific and computational methods employed. These memoranda are often preliminary in nature and are authorized by AWSR 80-2. They provide information needed by the users of AFGWC products and are for the information of other personnel conducting similar research or developmental work. Copies are available to military units and to non-military units associated with DoD activities. Other organizations may obtain copies through the Defense Documentation Center (DDC). DDC accession numbers (AD) are shown where known.

AFGWCTM 69-1 A DATA SELECTION PROCEDURE FOR THE RECTIFICATION AND MAPPING OF DIGITIZED DATA, Major Richard C. Roth, Dec 69 20 pages, AD 701374.

AFGWCTM 69-2 AFGWC FINE-MESH UPPER AIR ANALYSIS MODEL, Capt Rex J. Fleming, Dec 69, 14 pages, AD 710203.

AFGWCTM 69-3 DEVIATION ANALYSIS, Capt Philip W. West, Dec 69, 26 pages, (In preparation).

AFGWCTM 69-4 EVALUATING PROBABILITY FORECASTS, Major James S. Kennedy and Capt Preston G. Epperson, Dec 69, 8 pages, AD 701375.

AFGWCTM 69-5 TROPICAL WIND AND TEMPERATURE ANALYSIS, Major August L. Shumbera, Jr., 22 Dec 69, 14 pages, AD 702449.

AFGWCTM 70-1 THE AFGWC MESO-SCALE PREDICTION MODEL, Capt James Kerlin, 22 Dec 69, 14 pages, AD 709367.

AFGWCTM 70-2 THE AFGWC MACRO-SCALE UPPER AIR ANALYSIS MODEL, Major August L. Shumbera, 15 Mar 70, 28 pages.

AFGWCTM 70-4 THE AFGWC MACRO-SCALE BAROCLINIC PREDICTION MODEL, Capt Kenneth J. Palucci, 15 Mar 70, 14 pages, AD 709368.

AFGWCTM 70-5 AFGWC BOUNDARY LAYER MODEL, Lt Col Kenneth D. Hadeen, 1 Apr 70, 59 pages.

AFGWCTM 70-6 AFGWC AUTOMATED METEOROLOGICAL DATA PROCESSING, Lt Col Richard K. Wilson, 15 Sep 70.

A B S T R A C T

The present "state of the art" in automated meteorological data processing as practiced at Air Force Global Weather Central (AFGWC) is discussed. This includes major activities from interface with the Department of Defense operated Automated Weather Network (AWN) to the storage of individual reports into the AFGWC data base prior to scientific validity checks. Only the meteorological data processing or decoding of conventional weather reports is discussed. A description of the scientific validation of these reports is not included. Computer storage formats for each type of data are shown.

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1. INTRODUCTION

The meteorological data processing task at AFGWC is presently shared by separate computer systems. A dual UNIVAC 418 computer system functions as the terminal of the AWN. This system also disseminates edited bulletins directly to low speed display devices, reformats all data for the main meteorological processor and performs the identification and decoding functions for all surface observations and TAF's. All other data processing functions are performed by UNIVAC 1108 systems. Data are exchanged between the computer systems via high-speed external communications equipment.

All tasks presently performed by the UNIVAC 418 system will be assumed by the UNIVAC 1108 systems early in 1971. Although extensive re-programming is necessary, the concepts, and to a large degree, the techniques described in this paper will remain valid.

The data processing functions included within the context of this paper are: (1) message handling, (2) bulletin identification, (3) content recognition (decoding), (4) gross error checking, and (5) data formatting and storage. Scientific validation of the data and their use in mathematical models are not treated.

AWN INPUT (3600 BAUD)

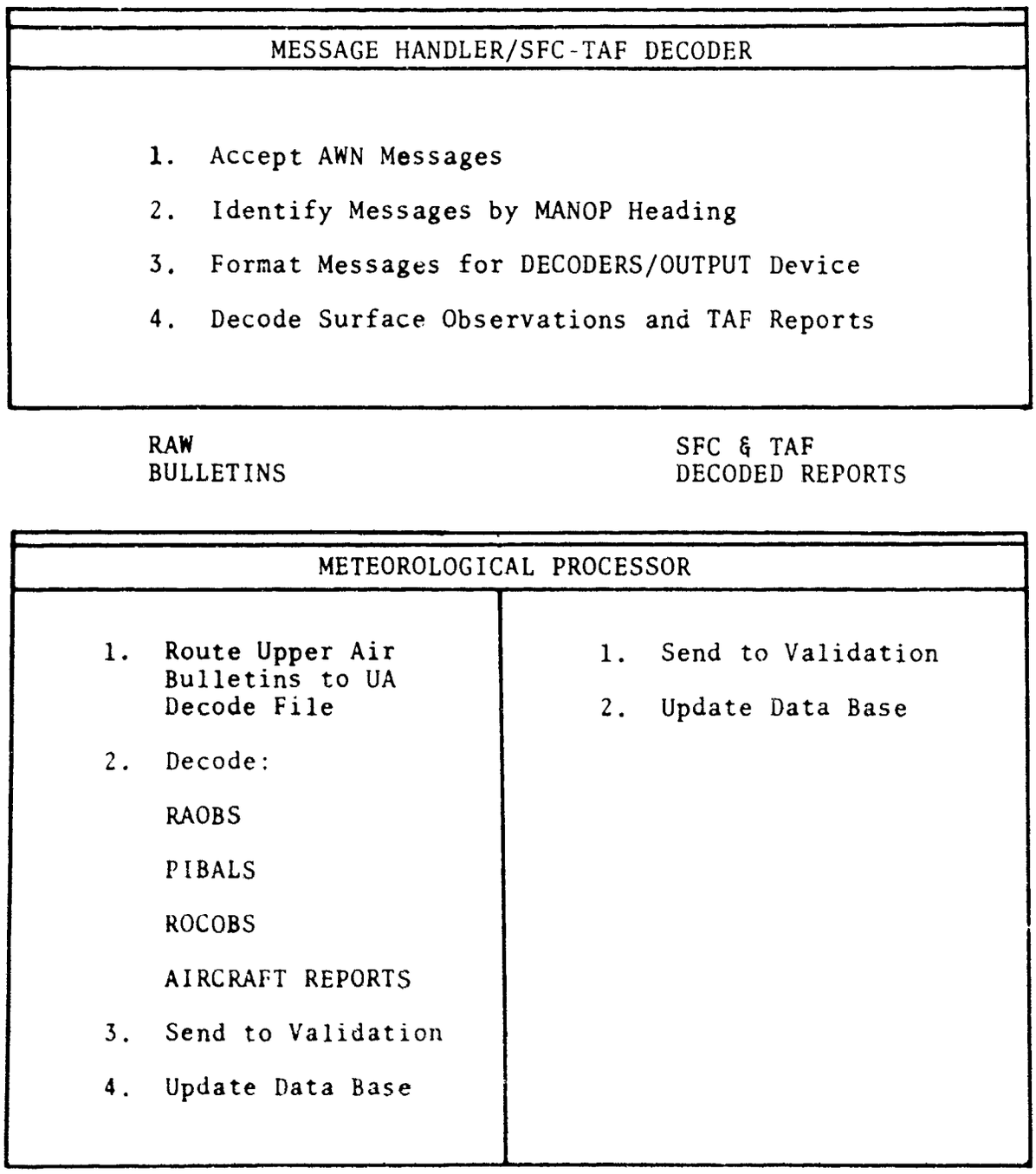


FIG. 1 DATA PROCESSING FLOW.

2. MESSAGE HANDLER

The bulletin processing program (BULHED) accesses data by 72 word segments, or buffers, from the initial raw data storage file. The data portion of the segment is in packed Baudot code as received from the AWN. Included are control information such as source circuit identification, receipt times at AWN sites, segment number, AFCS/AWS Manual of Operation (MANOP) numbers, character count, and a special indicator for administrative messages.

BULHED performs three main tasks during the processing cycle: code translation, regrouping of data, and routing assignments. Code translation simply involves a change from Baudot characters to the unique code which is used throughout the AFGWC Computer system. Data regrouping is accomplished by eliminating excess blanks between words (except for graphic display bulletins) and by generation of a new BULHED buffer of data. This buffer contains an individual teletype line, unpacked and translated. In addition to the information contained in the original segment, the BULHED buffer contains a count of the alphabetic and total characters in each data word, word count, routing information, WMO block number (if available), and MANOP heading. Special flags are set to indicate start-of-message or end-of-message buffers. Routing assignments for administrative messages are set based on a table of standard addressees. While reformating weather messages, a bulletin heading search is performed to establish WMO data type (FM) and to provide routing assignments. Routing of individual reports to decoders is

accomplished by WMO FM code type, and routing by specific bulletin heading is accomplished by referencing a library of MANOP Headings. WMO block numbers (if unique) are obtained from a table by using the geographical area designator in the bulletin heading. If a line consists only of a "999XX" group, the XX is stored as the WMO Block number pertaining to that message. A key word table is used by BULHED to adjust internal routing and as an aid for subsequent decoding.

When each BULHED buffer is complete, a routing program is utilized to pass each line to the designated decoder. Appendix 1 contains control word specifications for message transmission to the U1108 systems.

3. SURFACE AND TAFOR DECODERS

The basic functions of these decoders are to recognise individual reports within a message or stream of data, provide station library information with each report, and format each data element in a standard array for subsequent processing. To perform these three tasks, the decoders have several features in common. The types of reports processed by this program package are: SM/SI, SN, SA, METAR, AERC, and TAF.

In order to identify a type of report, each decoder uses an indexing system to keep track of its present position in the data buffer. This enables the program to look ahead or back up to check or recheck data. Counters or indexing tables are used to determine the character, word, or line being examined.

An important feature in a decoder is the multi-line capability. All except the AERO decoder (AERDEC) are able to request, from BULHED, additional lines of data while looking for the end of a report or the start of another report. All characters between the last recognizable piece of data and the start of a new report are treated as remarks. The start of a new report is established when a new station identifier or a key word is recognised. An up-to-date Block Station and Call Letter Library is absolutely essential under this concept.

While trying to identify a report, the decoder must make certain gross checks. The most important of these is a check of the format or syntax of the report. To check for proper form, the decoder looks for key words and checks the number of alphabetic and total characters per word. The report must also be a certain minimum length to be valid. The report must

contain a valid station identifier. Inclusion in the master station library is the criterion for station identifier checks. After a report has been identified and passed the gross checks described above, a test is made for duplicate reports. A check against the time of the last report from that particular station is used in the case of Land Synoptic, Airways, and METAR observations. A Julian time (the internal observation time, or, if not available, the bulletin heading time) is assigned to each observation. A computer bit "checksum" test of the entire report is made in the case of Ship and TAF reports.

During the processing, each report is reformated into buffers best suited for each type of user. The generation of the decoded buffer arrays is important since these buffers are utilized for subsequent meteorological applications. Appendices (2, 3, 4, 5 and 6) are diagrams of the decoded buffers used by the U1108 systems. Station library information is appended to each buffer; information includes runway direction, latitude, longitude, station elevation, type of units in which elements are measured, ICAO call letters and/or WMO block-station numbers. This information is obtained by referencing the station library by either call letter or block-station numbers. Other types of output buffers are those for teletype, high speed printers, and magnetic tape data collection.

Although the decoders have the above features in common, some characteristics are unique. Separate programs are used to process the four general surface code types: AERO, U.S. Hourlies for Aviation, Surface Synoptic, and TAF.

3.1 AERO DECODER

The AERO decoder (AERDEC) resides permanently in the computer memory (the other decoders are part of an overlay system and are accessed from

magnetic drum as needed). The AERO program is called by both the hourly and synoptic decoders since both SA and SN bulletins may contain reports encoded as AERO. If AERO formated data are not found, the line is returned to the using decoder for processing. If AERO Code is identified, program control is temporarily returned to the calling program until it outputs any data that may have been held pertaining to the previous report. Certain SA and SN bulletins known to contain no AERO data are not checked. Up to three words of a line may be scanned while looking for a station identifier or sudden change group. The program checks primarily for format, and references the master station library only if a line meets the format check. The other decoders use the library as part of the gross checks.

3.2 HOURLY DECODER

The Hourly decoder (SADECO) will process record as well as special reports in the METAR or AIRWAYS codes. The identification and separation of individual reports is accomplished primarily by format checks using the alphabetic and total character counts provided by BULHED. Checks are also made for key words that often flag the type of report (METAR, SPECI, etc.). Data formats checked by this decoder are fairly standardized, though not to the extent of the synoptic code. Data words are variable length, so the program concentrates primarily on parameter separation functions, such as spaces, slashes, dashes, hyphens and cloud symbols, to identify single elements within each report. It also logs the last type of data element identified and uses that information in determining the next element(s) that should follow. Fahrenheit temperatures are converted to degrees Celsius and miscellaneous visibilities to hundreds of meters for standardization in the decoded buffer.

3.3 SURFACE SYNOPTIC DECODER

The surface synoptic decoder (SYNDEC) processes reports that are more standardized than any other weather data. The use of five digit mandatory groups within the surface synoptic code makes this report extremely well suited for automated data processing. Because of the rigid format, few intermediate checks are necessary after station identification. The decoder formats the output buffer in nearly the same manner as the data were received and insures that each mandatory group contains five numeric characters. Ship reports are recognized by scanning for the mandatory "99LLL" group. The internal time within the ship report is used as the observation time in place of the bulletin heading date-time group.

3.4 TAF DECODER

Because the format of the terminal forecasts is more varied than that of other data, this decoder is the most complex. Reports processed by TAFDEC must be separated by station as well as by change groups within each station report. Individual TAF's are identified by looking for a new station identifier or for an initial change group. Individual forecast periods within a TAF are recognized by searching for key words (TAF, GRADU, RAPID, PROB, INTER, 98XXX, 97XXX, 96XXX). Initial change groups may contain multiple station identifiers. The program will provide a decoded TAF buffer for each of the station identifiers reported. To be decoded, an initial report must contain, as a minimum, the station identification, visibility, and wind elements. Other change groups are less restrictive in that only one forecast element such as visibility, wind, weather, or cloud group is required. Time,

if omitted, is estimated based on the time of the last report or last change group within a report. If a time group appears at the start of a data line, this normally indicates the start of a new TAF. Exceptions to this rule can be recognized by also checking for a new station identifier immediately following the time group; e.g., if the station identifier is the same as in the previous report, then the format conforms to the Canadian or certain U.S. Weather Bureau procedures which use multiple initial groups.

I. IDFNTIFY TYPE OF REPORT

A. AIRCRAFT

AWS RECCO | OTHER RECCO | COMBAR | MAC AIREP | CODAR | ICAO AIREP

B. OTHER REPORTS

S.L. | RAOB PART A | RAOB PART B | RAOB PART C | RAOB PART D | PIBAL PART A

PIBAL PART B | PIBAL PART C | PIBAL PART D | DROP PART A | DROP PART B | ROCOB

II. VERIFY TIME AND IDENTITY OF REPORT

A. TIME OF REPORT NOT MORE THAN 15 HOURS OLD

B. BLOCK-STATION MUST BE IN MASTER LIBRARY

III. APPEND LIBRARY INFORMATION

STN IDEN | LAT/ LON | GWC REG | STN ELEV | INST TYPE | WMO REG | WIND/ TEMP UNITS

IV. OUTPUT ELEMENTS OF THE REPORT

OUTPUT FORMAT | STAND UNITS

FIG. 2 UPPER AIR DECODER FUNCTIONS

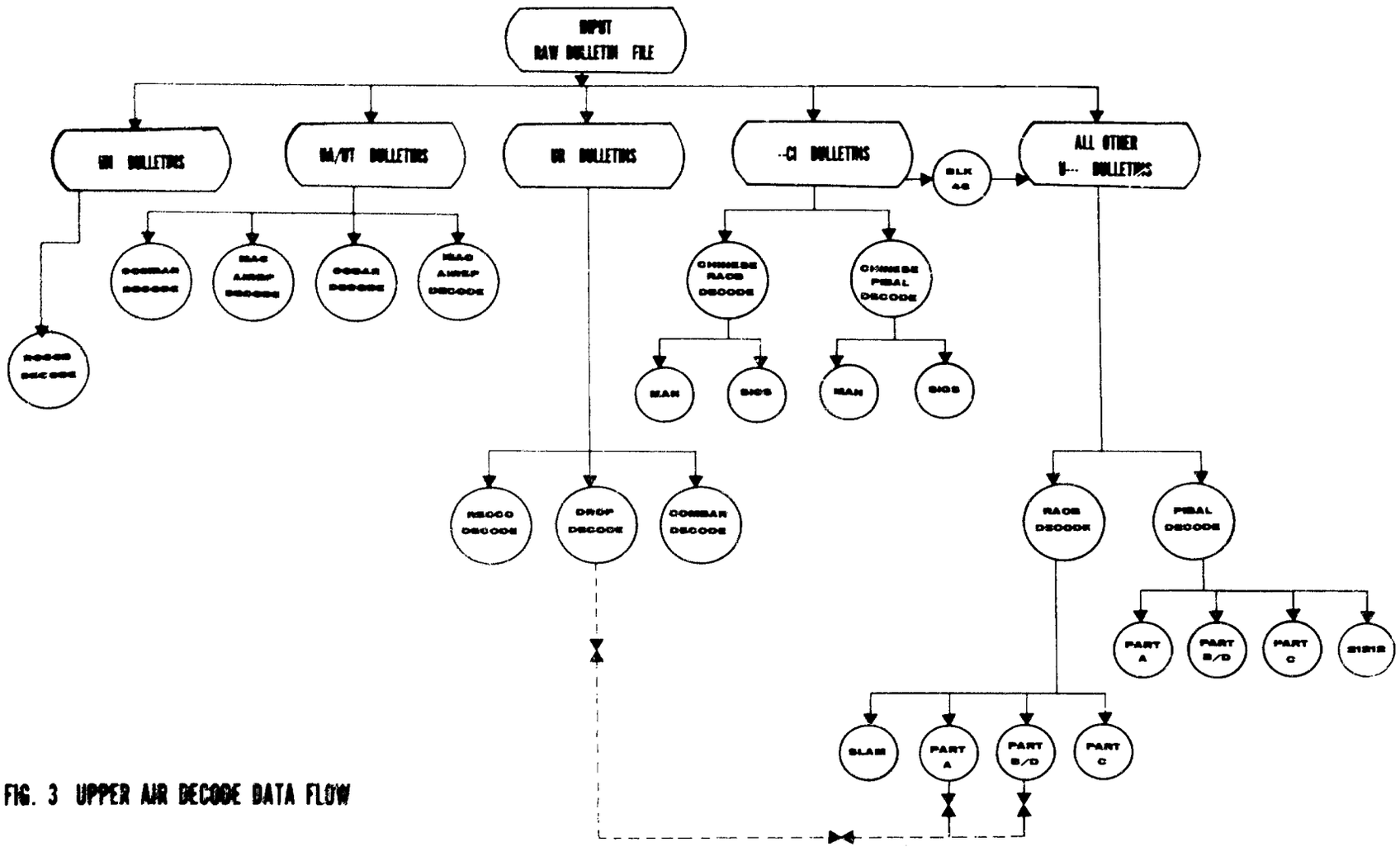


FIG. 3 UPPER AIR DECODE DATA FLOW

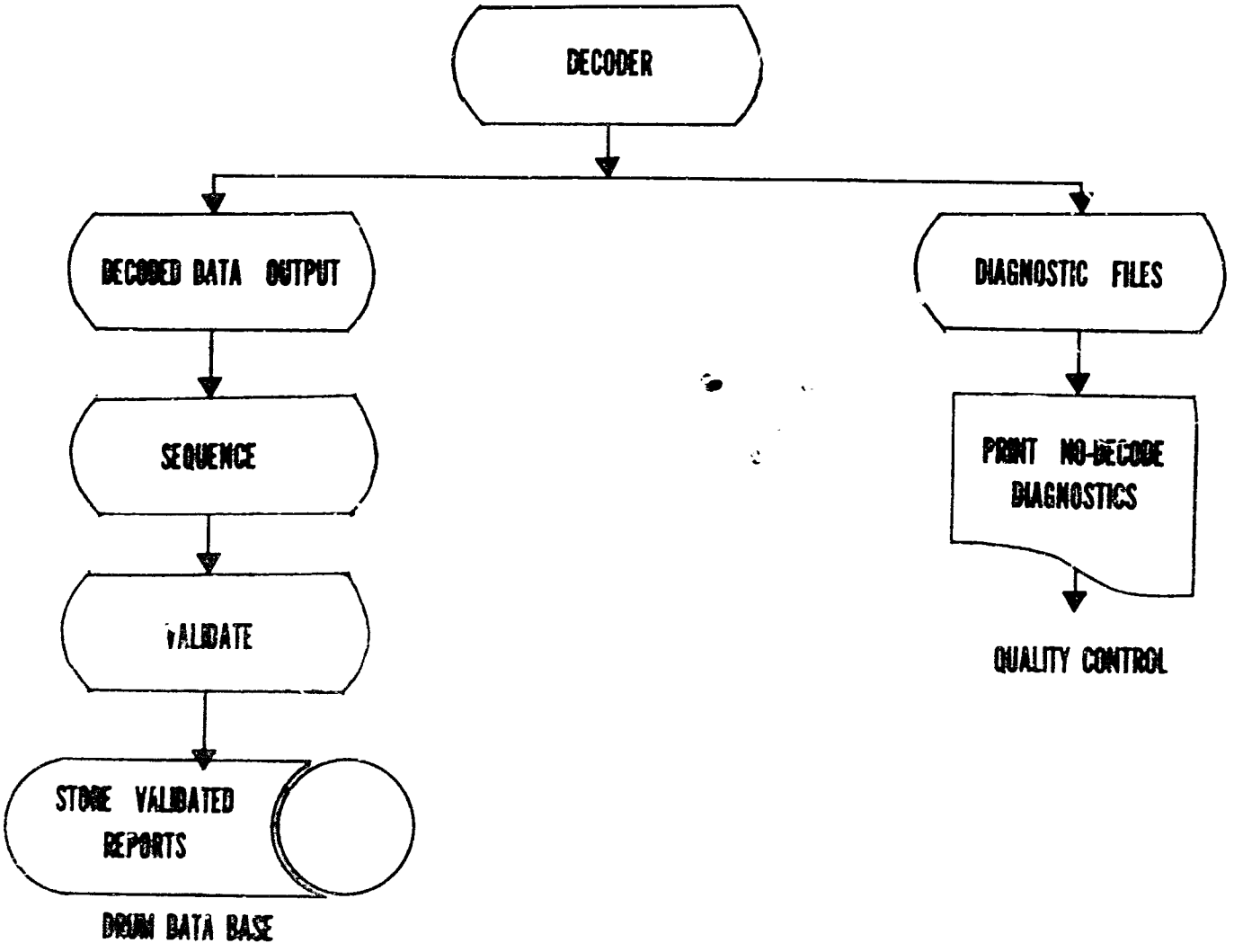


FIG.4 DECODER OUTPUT

4. UPPER AIR DATA PROCESSING

The specific functions of the Upper Air Decode Program (UADP) are:

- Accept Fieldata bulletin input from the message handler
- Identify each report by data type.
- Establish and verify time and identity
- Add pertinent library information from the Master Station Library
- Format all recognized information needed for subsequent validation and storage into the data base.

Figures 2, 3 and 4 illustrate data flow and tasks performed.

4.1 DATA INPUT

The UADP interfaces with a real time systems management program (Data Management) for input of data. Data Management stores UA, UR, and UT (Aircraft) data into one file and all other bulletins with headings beginning with "U" into another file. This second file includes all RAOB, PIBAL and ROCOB messages. At batch time, the decoders process the RAOB/PIBAL/ROCOB file and then the Aircraft file. This concept utilizes program segmentation most efficiently.

The input buffer size obtained from the Data Management program is 3360 (decimal) words. Data are moved from the input buffer (IBUFFA) to the processing buffer (RAW), and while processing continues, additional data are read into IBUFFA. The raw data have been left justified in 36 bit words by the message handler. A conventional word is defined as one of any two groups of characters separated by a blank. For example,

PA257 50N 10W 0616 FL250 MS53 200/100

is a conventional report of seven data words. This report is translated

by the message handler into left justified six character words as illustrated:

PA257	50N	10W	0616	FL250	MS53	200/100

An End-of-Line function (0770505050505) is also appended after the last word of each line. Thus, the line of seven conventional data words actually generates nine U1108 words.

4.2 TYPES OF REPORTS PROCESSED

Separate decoders are used for the following types of reports:

Selected Level (SLAM)

RAOBS, Part A (WMO format)

RAOBS, Part B/D (WMO format)

RAOBS, Part C

RAOBS, Mandatory levels (Chinese)

RAOBS, significant levels (Chinese)

PIBALS, Part A (WMO format)

PIBALS, Part B/D (WMO format)

PIBALS, Part C (WMO format)

PIBALS, (21212 groups -WMO format)

PIBALS, mandatory levels (Chinese)

PIBALS, significant levels (Chinese)

ROCOBS

Horizontal RECCO Aircraft reports

Dropsondes

COMBAR aircraft reports

MAC abbreviated aircraft reports

CODAR aircraft reports

ICAO aircraft reports

NOTE: Since the 21212 and 51515 (WMO Region VI) Sections are common to both RAOB and PIBAL (Part B/D) reports, the corresponding RAOB sections are sent to the appropriate decoder and output as a PIBAL, Part B or D. A RECCO report is output as either (1) AWS RECCO report or (2) other RECCO report. If a published AWS track name can be identified in the report, it will be output as (1) above. The dropsonde decoder is a linkage between the Aircraft decoders and the RAOB decoders. If the key words identifying a dropsonde are found, the report is sent to the RAOB decoder, but program control is returned to the dropsonde program for output.

4.3 INITIAL BULLETIN ROUTING

The initial routing of data to decoders is keyed to bulletin headings:

- UN bulletins are routed to the ROCOB decoder only;
- UA/UT bulletins follow a branch linked only to the MAC abbreviated, COMBAR, CODAR, and ICAO decoders;
- UR bulletins follow a branch linked only to the COMBAR, RE... and dropsonde decoders;
- Chinese Mainland bulletins are routed to the special Chinese decoders (Exception: an initial check is made to see if a Chinese bulletin contains Block 46 (Formosa) data; if Block 46 data are found the bulletin is diverted to the WMO RAOB/PIBAL stream);
- All other bulletins follow the branch which processes WMO format RAOB/PIBAL data.

Each of the five major branches has a control subroutine to check time and identity of each report and to set the buffer word index to the first data word of that report before calling the "most likely" decoder.

4.4 REPORT IDENTIFICATION

Two fundamental concepts are used in locating the beginning of a new report and in pre-processing the data so they may be efficiently used by an individual decoder. Special format routines deal with these two tasks: data pre-look and beginning-of-report identification.

4.4.1 Data Pre-Look

RAOB and PIBAL data (including Mainland Chinese) are largely five digit "numeric groups," with the exception of the initial WMO message identifiers, ship names or ice island (Arctic ice pack) designators. Other exceptions are normally a result of circuit garbling. The format subroutine attempts to salvage unclean data (separating run-together groups, converting alpha to numeric characters where possible, and flagging anomalies to the using decoders). The subroutine builds a beginning-of-report array (IRPT) for use by the routing procedures.

4.4.2 Beginning-of-Report

Prior to processing by individual decoders, the beginning of each new report must be firmly established. In order to allow for embedded WMO message identifiers, PIBAL and RAOB procedures search for special indicators to establish the beginning of a report. Procedures for other types of data use a line-by-line concept. WMO PIBALs and RAOBs contain three separate indications which are used to establish the beginning of a report. Any one or a combination of the following indicators will flag a possible beginning of report in the IRPT array:

(1) A previous scattered (©) symbol (indicating the end of report).

(2) WMO message identifier (TT, PP, QQ, WW, etc.) indicates the type of report to follow.

(3) A four or five digit word which passes the time check.

It is possible for a data word to pass the time check. However, each decoder records the address of the last data word used in the data buffer. If the address of the last word is greater than the address of the beginning-of-report address in the IRPT array, routing will select the next beginning-of-report address.

Chinese bulletins may or may not contain the ⓪ symbol and WMO message identifiers. Some Chinese reports contain internal times; others do not. Therefore, the Chinese decoders use the start of each line as a possible beginning of report for the IRPT array. ROCOB data contain a very distinctive time word (a six digit numeric word in otherwise five digit groupings). This word is therefore used for the IRPT array when processing UN bulletins.

4.5 TIME IDENTITY CHECK

After the beginning of a report has been established, the routing programs key on the time and identity words, verify and prepare them for output. Time and identity verification criteria and procedures follow.

4.5.1 The time of the report must be within a specified number of hours (presently 15) of the computer real-time clock.

4.5.2 The WMO block-station number of a land report must be contained in the master station library as an upper air reporting station. If not, the report is not processed; however, an abbreviated "ID" report is prepared which is used by survey programs for updating of the library.

4.5.3 All ship reports pass through a permanent ship check. If the reported ship location is within a one-half degree box of any one of the permanent Ocean Station Vessel (OSV) locations, the report is identified as from that OSV, and the corresponding station library information is appended.

4.5.4 A ship report which fails the permanent OSV check is processed as a roving ship using the reported latitude and longitude location. An OSV which is off-position will be processed as a roving ship, but if the OSV identifier is reported, will be identified by that OSV identifier in the control words.

4.5.4 Reports from stations on the arctic ice pack will be processed as roving ships.

4.5.5 Ship reports with garbled positions will not be processed.

4.5.6 Any report which can not be properly identified by time, position, and altitude (for aircraft reports) is placed in a non-decoded diagnostic file which is printed after each batch cycle. Essential reports can therefore be manually corrected and re-inserted into the system.

4.6 INDIVIDUAL REPORT ROUTING

Individual reports within a bulletin first are routed to a "most-likely" decoder, selected on the basis of key words, WMO message identifiers, or unique indicators within that report. The procedures used within individual data routing branches follow:

4.6.1 Aircraft (UA) bulletins.

(a) If the word CODAR is found in the bulletin, or if a report begins with CC, the reports are routed to the CODAR decoder only.

(b) If the word COMEAR is found in the bulletin, the reports are routed to the COMEAR decoder only.

(c) If the word AIREP is found in the bulletin (or no key word is found), a scan of each line is made for the following indicators:

(1) If an FL, MS, PS, or TTS is found, the report is routed to the ICAC decoder only; (2) If a P or M is found, it

is routed to the MAC abbreviated decoder only. If none of the above indicators are found, the report is routed first to the MAC abbreviated decoder, and failing this, to the ICAO decoder.

4.6.2 RECCO bulletins (routed by key words or indicators).

(a) If the indicator 9XXX9 is found and followed by the indicators 71717, TT or VV, the report is sent to the appropriate RAOB decoder for subsequent processing.

(b) If only the 9XXX9 indicator is found, the report is routed to the RECCO decoder.

(c) If no indicators are found, routing is to the COMBAR decoder only.

4.6.3 CI (Chinese) Bulletins

(routed according to indicators found within the report).

(a) Those reports containing five digit groups 44444 or 88883 or two initial data words beginning with 3_____, 6_____, are sent to the Chinese PIRAL decoder. The PIRAL decoder will pass control between the mandatory and significant level routines as required by the content of the report.

(b) Those reports containing the five digit groups 33333, 55555 66666, or a combination of the indicators 85___, 70___, 40___, 30___ and 20___, are routed only to the Chinese RAOB decoder. The RAOB decoder will pass control between the mandatory and significant level routines as required by the content of the report.

(c) Any Chinese report which does not contain one of the above indicator configurations will be routed first to the RAOB decoder and, if decoding fails, to the PIRAL decoder.

4.6.4 Other bulletins (routed on the basis of WMO message identifiers).

(a) Those reports containing identifiers TT, VV, WW, or YY are sent first to the RAOB decoder. Control will be passed to the RAOB Part A, B/D, or C routine as indicated. If the report fails its "most likely" routine, all other routines will be tried. If all fail, the report will be sent to the PIBAL decoder for successive attempts.

(b) The Part B/D RAOB decoder first looks for SLAM indicators, and, if found, will route directly to the SLAM decoder.

(c) Those reports containing the WMO message identifiers PP, QQ, MM, or LL are sent to the PIBAL decoder and will be treated in a similar manner to that described in (a) above.

(d) If no WMO message identifier is found, the report will be sent first to the RAOB decoder. Failing all RAOB Part decoders, the report will pass through the PIBAL Part decoders.

4.7 OUTPUT FORMAT

The elements of each processed report are output in arrays of standard units (meters, meters/sec and degrees absolute). Appendicies 7, 8, 9, and 10 describe the specific formats of the output file which is used by successive validation programs. Library information from the master station library is appended to each land station and OSV report by means of control words. In addition, source information (original circuit, bulletin, and receipt times) is appended for subsequent use in data survey applications.

A P P E N D I C I E S

NOTES ON THE CONTENTS OF THE APPENDICIES

1. The contents of words of data and their formats are described in the following appendicies. Individual word formats are given, including the arrangement of sub-divisions of packed-data words. The number of bits required for individual parameters or indicators stored within the word sub-divisions are entered below the parameter labels. In those cases where sub-divisions are not used, the symbol 0 has been employed.

2. An economical means of unpacking data is required to facilitate the packed-storage scheme. The UNIVAC Fortran V sub-routine FLD is normally used for parameters which have only positive values. For those parameters which may be negative as well as positive, an internally defined function (FLDS) is employed. In Fortran V, this function is made available by including the following DEFINE statement in the user program:

DEFINE FLDS (I,K,E) =LOCL (E) *2**I/2**(36-K)

where I = Bit number (0 to 35, left to right) of the left most bit in the sub-division of the word

K = Number of bits in the sub-division of the word

E = Word which is to be unpacked

The use of the FLD and FLDS functions (and the definitions of arguments) within a program is identical; the results differ in that the FLDS function provides for an automatic sign-bit extension in the unpacked word. Suppose that bits 9 thru 14 of a word (IWORD) are to be unpacked, and the result stored in a second word (JWORD).

Content of IWORD: 0 1 2 3 4 5 6 0 1 2 3 4 5

JWORD = FLD (9, 6, IWORD) results in contents of JWORD: 0.....045

where

JWORD =FLDS (9, 6, IWORD) results in contents of JWORD: 7.....745

3. Reports received at AFGWC are not infrequently garbled or incomplete; missing parameters must be readily identifiable during data processing performed subsequent to the processing described in this technical memorandum. Where storage space has been alloted, but data are not available, the decoding programs conventionally set all bits within the alloted storage space. The Fortran V FLDS function previously described offers an efficient means of unpacking these missing data indicators.

APPENDIX 1

1108 CONTROL WORDS FOR BULLETINS

WORD 0

JULIAN HOUR	WORD COUNT
18	18

JULIAN HOUR - The number of hours from a AFGWC pre-selected 'zero' time.

WORD COUNT - Supplied by the U1108 system.

WORD 1

KOFF	2ND ADWS	1ST ADWS
12	12	12

KOFF - Receipt time at Offutt (in binary: 1st 6 bits = Hr, 2nd 6 bits = Min).

2ND ADWS - High speed receipt time at FWH.

1ST ADWS - Low speed receipt time at HW, FU, or FWH.

WORD 2

H	L	MANOP NUMBER	0	F
6	6	18	5	1

H - High speed circuit identification.

L - Low speed circuit identification.

F - Bit set to identify bulletin type data.

MANOP NUMBER - MANOP Number with top bit set if it's a DUPE.

WORD 3

DAY	HOUR	MINUTE	FIRST 3
6	6	6	18

DAY, HOUR, AND MINUTE - Bulletin heading in binary.

FIRST 3 - First three (3) characters of the bulletin heading in Fieldata.

WORD 4

LAST 6

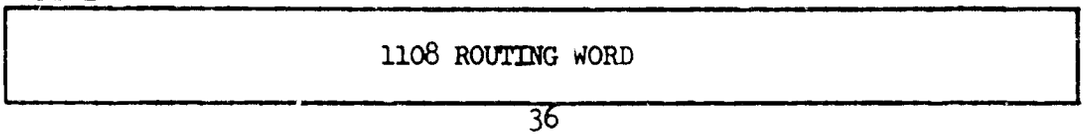
36

LAST 6 - Last six (6) characters of the bulletin heading in Fieldata.

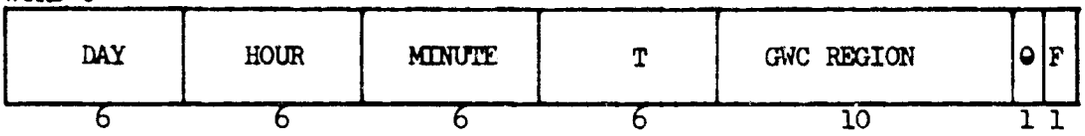
APPENDIX 2

1108 ROUTING WORDS

WORD -1



WORD 0



DAY, HOUR AND MINUTE - Report time.

T - Type of data:

0 = decoded forecast

1 = Roving ship - zero fill GWC REGION

2 = block/station and perm-ship

3 = special

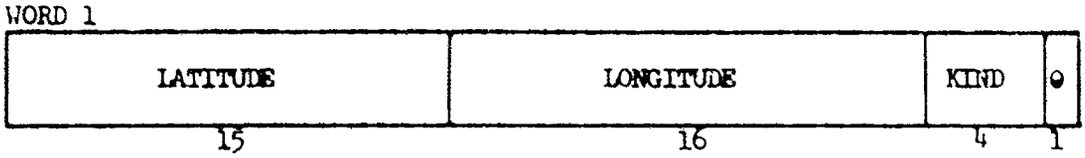
4 = IL report (not in library)

5 = inactive report

6 = metwatch lib update (do not store in data base)

F - Identification that this is decoded data (bit not set).

WORD 1



LATITUDE and LONGITUDE - To the nearest hundreth of a degree.

KIND - Kind of sfc report:

0 = TAFOR

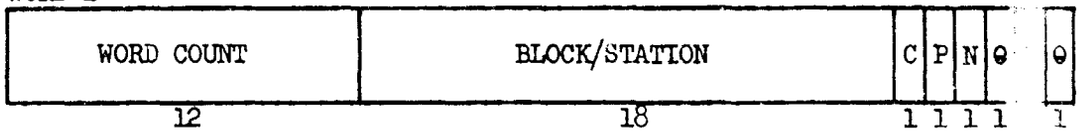
1 = SM

2 = AW

3 = METAR

4 = AERO

WORD 2



WORD COUNT - 1108 filled

BLOCK/STATION:

Land report - WMO block/station number
Land report, call letters only - blank fill
Permanent ship (OSV) dummy block/station numbers
4YA = 00001
4YB = 00002 ..etc
Name ship - dv/vs right adjusted, eight bits
dv/vs = direction and speed of ship
No name - zero fill

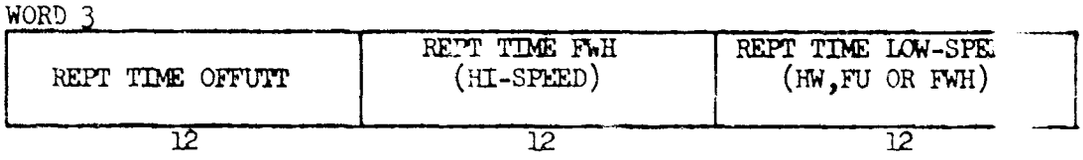
C - Bit set for corrected report

P - Bit set for permanent ship

N - Bit set for name ship

D - Duplicate report (same kind of rpt for same day and time)
0 = dupe
1 = non dupe

WORD 3



REPT TIME - All three receipt times are in binary, with the form:
hour = first six bits
minutes = second six bits

WORD 4

CALL LETTERS - Land station with no call letters - blank fill
OSV, Perm-ship = 4YA, 4YB, 4YC, etc.
Name ship = Ships name
No name ship = "SHIP"

V - Valid rpt (rpt was used in the data base)
    0 = Non-valid
    1 = Valid

W - Indicator for wind units

P - Indicator for pressure (reporting type)

K - Indicator for temperature units

WORD 5

STA ELEV	CLT	SRP CLT	MINUTE	WMO RLG	0
15	6	4	6	3	2

STA ELEV - Station elevation to the nearest meter.

CLT - Hardware CLT

SRP CLT - 0 = Offutt
1 = Fuchu
2 = High Wycombe
3 = (not used)
4 = Monterey
5 = Carswell
6 = Clark

MINUTE - 1108 filled

WORD 6

MANOP NUMBER	0
18	18

MANOP NUMBER - MANOP number with the top bit set if it is a duplicate bulletin.

APPENDIX 3

AIRWAYS 1108 DATA WORDS

WORD 1

PPP	TT
18	18

PPP - Pressure in tenths of millibars (Fieldata)

TT - Temperature in Celsius to the nearest tenth of a degree reported in binary. (Complemented if temperature is below zero).

WORD 2

T_dT_d	ALT
18	18

T_dT_d - Reported same as TT.

ALT - Altimeter setting in hundredths of inches (Fieldata).

WORD 3

Θ	C	VVV
12	6	18

Θ - Filled with Fieldata zeros

C - Set equal to 1 if visibility is reported to be variable; otherwise set equal to 0.

VVV - Visibility in hundreds of meters (binary).

WORD 4

DDD	FFF
18	18

DDD - Wind direction in whole degrees (Fieldata).

FFF - Wind speed in knots (Fieldata).

WORD 5

GGG - Wind speed gusts in knots (Fieldata).

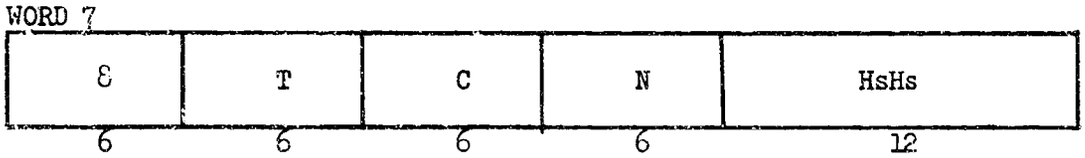
APP - Pressure tendency and change (Fieldata).

WORD 6

PPP - Pressure change of 9.9 mbs or more (Fieldata).
PP in WORD 5 will be reported as 99.

RRR - Amount of precip in hundreds of inches (Fieldata).

WORD 7



8 - Indicator for cloud groups (Fieldata).

T - Type of measuring device (A,M,E,R,W,B,V,D,I) Fieldata.

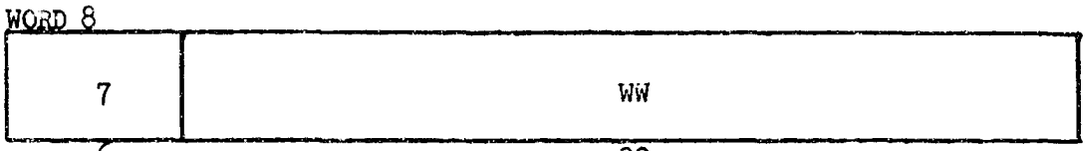
C - Layer characteristics (Fieldata).
C = 1, Variable Height
2, Variable amount
3, Thin clouds (- , - , -)

N - Sky condition (Fieldata)
N = 1 Scattered
2 Broken
3 Overcast
9 Obscured
77 Partially obscured

HsHs - Cloud height from WMO Code Table 1677 (Fieldata).

Note: If clear WORD 7 will be coded 800000 (Fieldata).
WORD 7 will be repeated for each cloud reported.
High clouds that do not report a height will be coded as 89.

WORD 8

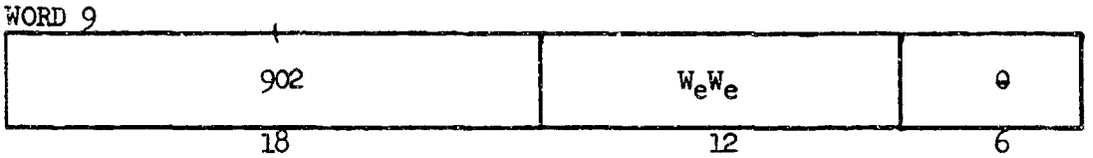


7 - Indicator for weather group (Fieldata)

WW - Alpha characters as reported (Fieldata If no weather WORD 8 will be coded 700000 WORD 8 will be repeated up to ten (10) weather characters.)

NOTE: WORDS 9 thru 14.will only be included if those groups are reported; these words are all Fieldata coded.

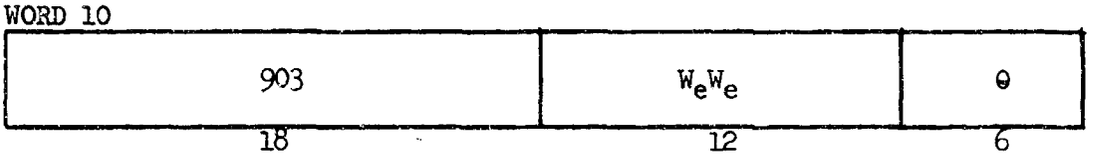
WORD 9



902 - Indicator for special group

W_eW_e- Water equivalent of precipitation in tenths of inches.

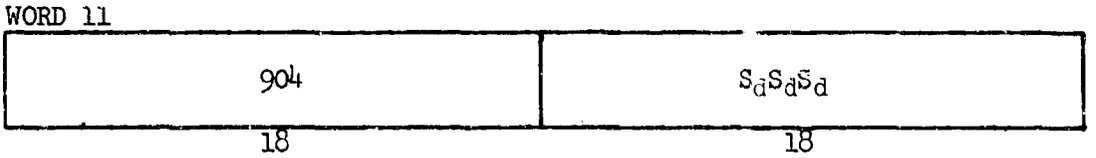
WORD 10



903 - Indicator for special group

W_eW_e- Water equivalent of precipitation in whole inches.

WORD 11



904 - Indicator for special group.

$S_dS_dS_d$- Snow depth in whole inches.

WORD 12

1	T_xT_x	$C_LC_MC_H$
6	12	18

1 - Indicator for max (or min) temp and/or cloud code group.

T_xT_x- Two (2) digit temperature, max or min, as reported.

$C_LC_MC_H$- Three (3) digit cloud code group.

WORD 13

2	$R_{24}R_{24}R_{24}R_{24}$	0
6	24	6

2 - Indicator for 24-hour precipitation group following.

WORD 14

4	T_xT_x	T_nT_n	0
6	12	12	6

4 - Indicator for max and min temperature groups.

WORD 15

FIELDATA ZEROES
36

Indicator for "Remarks Following"

WORD 16

FIELDATA ONES
36

Indicator for "Raw Data Following"

NOTE: All missing data will be indicated by slashes (/)
... e.g. Fieldata 074.

APPENDIX 4

METAR 1108 DATA WORDS

WORD 1 and WORD 2 are the same as in AIRWAYS Code.

WORD 3

ØCAVOK (Fieldata)
36

Same as in AIRWAYS Code except when CAVOK is reported this will be coded as above in Fieldata.

WORD 4, WORD 5, and WORD 6 same as in AIRWAYS Code.

WORD 7

8	TT	N	H_SH_S
6	12	6	12

8 - Indicator for cloud group (Fieldata).

TT - Type of cloud (ALPHAS) Fieldata .

N - Amount of clouds (1-9) Fieldata .

H_SH_S- Cloud height from WMO Code Table 1677.

Note: If CAVOK is reported WORD 7 will appear as (8CAVOK) Fieldata.
If CLEAR is reported WORD 7 will appear as (800000) Fieldata.
If a CEILING remark is reported in the observation the last cloud group will be the ceiling. This will appear as (8888H_SH_S) Fieldata.
If the remark, NOCIG, is reported it will appear a (8888BLANK BLANK) Fieldata.

WORD 8

7	WWØØØ
6	30

7 - Indicator for weather group (Fieldata)

WW - Weather in METAR numeric code (Fieldata).

Note: If CAVOK is reported WORD 8 will appear as (7CAVOK) Fieldata.

WORD 9 thru WORD 16 same as AIRWAYS code.

NOTE: All missing data will be indicated by Fieldata slashes (074).

APPENDIX 5

TAF 1108 DATA WORDS

WORD 1 thru WORD 8 - Control WORDS for decoded data.

WORD 9

T	N	Θ	RUNWAY	BULLETIN D/T
3	4	5	6	18

T - Type of report: 001 - Original
101 - Amend
110 - Cor

N - Number of change groups, max 11 (binary); if 0 report not decoded.

RUNWAY - Runway direction - 10's of degrees (binary).

BULLETIN D/T - Day/Hour/Min 6 bits each (binary).

WORD 10

C	B	E	Θ	R	Θ	COV	HEIGHT
3	5	5	5	1	1	4	12

C - Type of Change: 001 - INITIAL
010 - RAPID
011 - GRADU
100 - INTER
101 - TEMPO
110 - PROB
111 - CANADIAN STNS THAT DO NOT SEND CHANGE GROUP

B - Beginning hour of change (binary)

E - Ending hour of change (binary)

R - 1 if clouds reported

COV - Cloud cover (0-9) binary

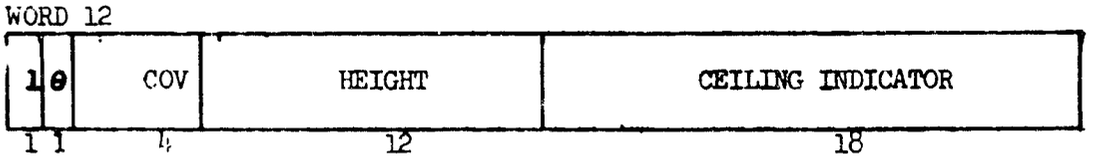
HEIGHT - Cloud height in 100's of feet (binary)

WORD 11

R	Θ	COV	HEIGHT	R	Θ	COV	HEIGHT
1	1	4	12	1	1	4	12

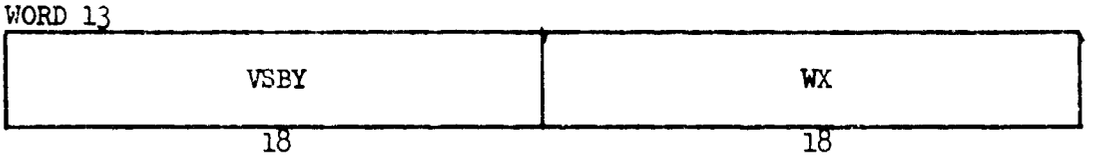
NOTE: See WORD 10 for explanation of code

WORD 12



See WORD 10 for explanation of code for bits 18-35.
Bits 0 -17 will be 100000000000000000 if remark NOCIG.
Bits 0-17 will contain ceiling height if reported.
If CAVOK bits 0-17 will be set.

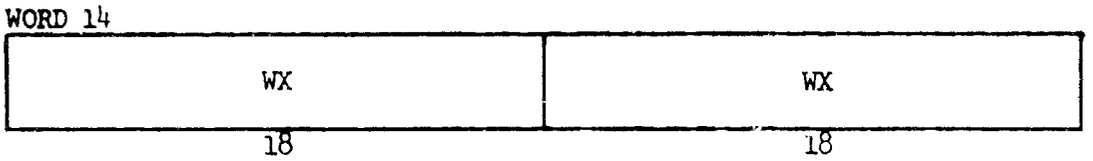
WORD 13



VSBY - Visibility in 100s of meters (binary)

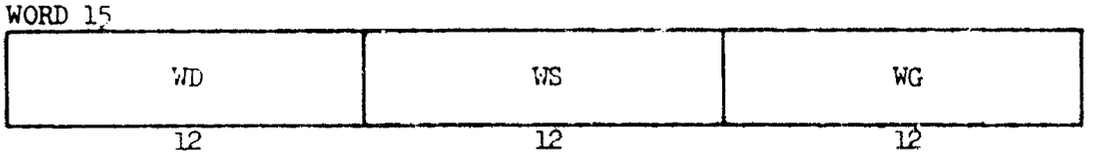
WX - 1st fcst weather reported in numeric code value (Fieldata leading blank plus two char).
If CAVOK all bits are set in WORD 13.

WORD 14



WX - 2d and 3d fcst weather reported in numeric code value (Fieldata).

WORD 15

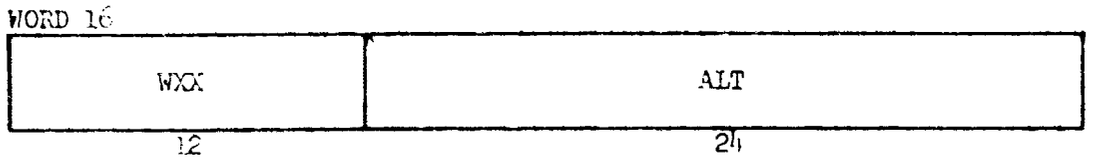


WD - Wind direction in 10s of degrees (Fieldata).

WS - Wind speed in knots (Fieldata).

WG - Wind gusts in knots (Fieldata).

WORD 16



WXX - Cross wind in knots (Fieldata).

ALT - Altimeter setting in inches (**Fieldata**)

NOTE: Repeat WORDS 10 through 16 for each change. A WORD of binary zeros follows last change group and indicates that the raw **data are** following. **Fieldata** spaces indicate missing data.

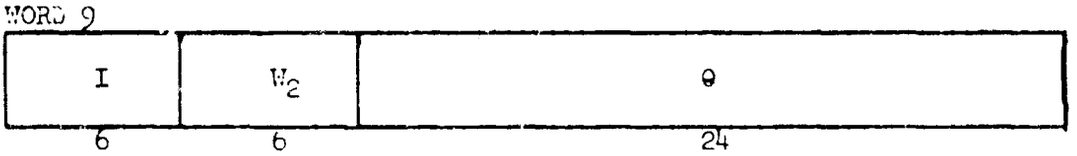
APPENDIX 6

AERO 1108 DATA WORDS

GENERAL: All words are Fieldata coded, blank filled, and contain 36 bits. Standard synoptic codes are used. Words are left-justified, with the possible exception of remarks. Δ = Field Data blank (05). WORD 9 will always be included in the buffer. Valid AERO reports contain at least the 'Nddff' and'VVwwW' groups. An 8-group is supposedly mandatory, but is often omitted when there is no cloud cover.

WORD 1 thru 8 1108 Control Words for Decoded Data.
(NOTE: In WORD 3, KIND = 4 for AERO)

WORD 9

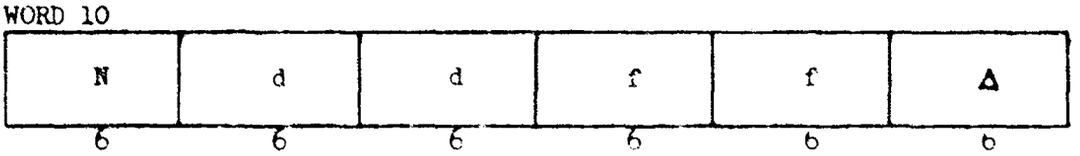


I - Indicator for special weather report (sudden changes).
B for improvement in weather conditions.
M for deterioration of weather conditions.

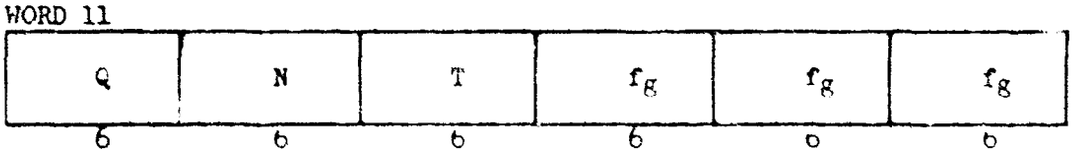
W_2 - Weather element causing the sudden change (Code 4663).

Note: Word will contain Fieldata blanks if no sudden change is reported.

WORD 10



WORD 11



Note: 'fff' group may contain 1, 2, or 3 characters.

WORD 11 (12)

V	V	w	w	W	Δ
6	6	6	6	6	6

WORD 12 (13)

8	N_s	C	h_s	h_s	Δ
6	6	6	6	6	6

WORD 12 (13) is repeated for each cloud group.

Note: There may not be a cloud group if there is no cloud cover (i.e., if 'N' from 'Nddff' = 0).

OPTIONAL GROUPS:

WORD 13 (14) - (Plus number of 8-groups)

0	T	T	T_d	T_d	Δ
6	6	6	6	6	6

WORD 14 (15) - (Plus number of 8-groups)

9	S_p	S_p	s_p	s_p	Δ
6	6	6	6	6	6

This word is repeated for each special phenomenon.

Note: This section is coded as received and may not be left justified.

APPENDIX 7

RAOB/PIBAL 1108 CONTROL WORDS

The following control words are for Radiosonde Observations (RAOBs) and Pilot Balloon Observations (PIBALs). All elements of words are in binary integers unless otherwise specified.

WORD 1

JULIAN HOUR	TYPE OF REPORT	GWC REGION	Q	A
18	6	10	1	1

JULIAN HOUR - Data Management will put bulletin heading time here. Decode will replace this time with the basic time before sending to the checking program.

TYPE OF REPORT - Code figures have been selected to conform with decoded surface output from the 418.

4 = ID Report (not in library). These reports will be output to the checking program and also written on the "NODECODE" file so as to be available to the monitoring analyst. If the block station is all numeric, then it will be coverted to binary and stored in control WORD 3. If the block station contains one or more non-numeric characters, then all 18 bits in control word 3 will be turned on and the block station will be stored in the first 30 bits of control WORD 5 in Fieldata.

5 = Inactive station - note under ID reports applies.

7 = U/A Blockstn, OSV Report, Roving Ship, and Dropsonde.

A - Wind data units (0 = MPS, 1 = KTS).

CONTROL WORD 2

LATITUDE	LONGITUDE	KIND
15	16	5

LATITUDE and LONGITUDE will be in units of hundredths of degrees. (negative latitudes (South) and negative longitudes (East) will be stored as negative numbers).

KIND - Code figures have been selected for sequencing order for each report; i.e., any Part B RAOB will follow the Part A report for that station.

5 = SLAM

6 = RAOB, PART A

7 = RAOB, PART B

8 = RAOB, PART C

9 = RAOB, PART D

10 = PIBAL, PART A

11 = PIBAL, PART B

12 = PIBAL, PART C

13 = PIBAL, PART D

14 = DROP, PART A

15 = DROP, PART B

16 = ROCOB

NOTE: Before Dropsondes are actually output to validation, KIND for dropsondes is overwritten so that 14 is replaced by 6 and 15 is replaced by 7.

CONTROL WORD 3

WORD COUNT	BLOCK/STATION	C	T	DUP	X
12	18	1	3	1	1

WORD COUNT - Word count of control words plus data words.

BLOCK/STATION - If a report is from a land station with an assigned WMO BLKSTA number, block - station will be output as a binary number, otherwise, these 18 bits will contain the following:

(1) A land report (call letters only) - ZERO FILL.

(2) OSV Ship Report - Dummy BLKSTA

4YA = 000001

4YB = 000002, etc.

(3) Name ship/noname ship/drop - zero fill.

(4) ID report (Not in Library) and block - station not all numeric - All bits turned on (see control word 5).

C - Bit set for a corrected report.

T - These bits set according to following table:

1 - BLKSTA	4 - Name Ship
2 - OSV Ship	5 - Land Station, Call letters only
3 - No Name Ship	6 - Drop

X - Bit set if all elements of a total report have been found. ROCOBS will always leave this bit open.

DUP - Bit set if this is duplicate report (this bit will be left as a "0" by decoder and data validation will determine if the report is a duplicate).

CONTROL WORD 4

RCPT TIME - OFF	RCPT TIME - FWH (HIGH)	RCPT TIME - HW,FU,FWH(LOW)
12	12	12

This word is a control word attached to each upper air raw data bulletin by the message handler. The decode program will pass this word on to the checking programs.

CONTROL WORD 5

CALL LETTERS	I	V	W	G	VAL
24	6	1	2	1	2

CALL LETTERS (Fieldata)

(1) Stations with 3 or less alphanumeric call letters will have trailing blanks; e.g., OMA$\not\beta$.

(2) An OSV will have 4YA$\not\beta$, 4UB$\not\beta$, etc.

(3) A name ship will have the ship's name (First 4 characters).

(4) A no-name ship will have the word "SHIP".

(5) A land station with no call letters will be blank filled.

(6) A Dropsonde report will have the word "DROP".

(7) If ID report and BLKSTA is not all numeric BLKSTA will be stored in first 36 bits in field data. (See CONTROL WORD 3).

I - RAOB instrument type-picked up from library.

V - Verification bit - left open by decoder; data validation will determine if this is a validated report.

W - Indicator for units: 0 = Fahrenheit/knots

1 = Celsius/knots

2 = Celsius/meters per second

VAL - Reserved for validation.

CONTROL WORD 6

STATION ELEVATION	CLT	SPR CLT	MINUTES	WMO REG	DATA BITS
15	6	4	6	3	2

STATION ELEVATION - The station elevation is given to the nearest meter. Negative station elevations will be stored as negative numbers.

CLT - Hardware Circuit (this information is passed from the message handler via CONTROL WORD 3 of the raw bulletin).

SPR CLT - 0 = Offutt
1 = Fuchu
2 = High Wycombe
3 = (not used)
4 = Monterey
5 = Carswell
6 = Clark

This information is passed from the message handler via CONTROL WORD 3 of the raw bulletin.

MINUTES - For any report-time containing minutes (e.g., possibly drops) the minutes will be placed here.

WMO REG - Obtained from the master library. Drops will have "0" (zero) for WMO Region.

DATA BITS - 00 = Real data via AWN
01 = Real data-manually inserted
11 = Synthetic data-manually inserted

CONTROL WORD 7

MANOP NUMBER	MMM	Ula	Ulo
18	10	4	4

MANOP NUMBER - Received from AWN.

MMM - Number of the WMO Marsden square. Since this is only available for ship data, the right 18 bits will be left open for land stations.

Ula - Units digit in the reported latitude for ship reports.

Ulo- Units digit in the reported longitude for ship reports.

CONTROL WORD 8

PARAMETERS	TROPS	MAX WINDS	T	250	A4	LEVELS	LEVEL OF SFC	U	REPORT TIME
9	3	3	1	1	3	7	3	1	5

PARAMETERS - The number of parameters (e.g., heights temperature, winds) decoded from a report.

PARAMETERS = M x LEVELS - GARBLES

where M is the number of possible parameters per level.

LEVELS - The number of levels contained in the report.

TROPS - The number of tropopause groups contained in the report.

MAX WINDS - The number of maximum winds contained in the report.

T - Set on if the max wind is the terminating wind of the sounding.

250 - Set on if 250mb is included in the report for PART B (RAOBS) only.

U - PIBAL units indicator - 0 - reports height, 1-reports pressure level.

A4 - PIBAL indicator specifying the type of measuring equipment used.

LEVEL OF SFC - In Part A RAOBS the surface level will be inserted in descending pressure order. The sequence number of this level is given here. If these three bits are open, no surface level was reported. If the three bits are all on, then the SFC is the first level, but the value is garbled or not valid.

REPORT TIME - The reported hour of the report (balloon release time for PIBALS AND RAOBS).

APPENDIX 8

UPPER AIR 1108 DATA WORDS

RAOB DATA WORDS

Unless otherwise specified, all elements of the words will be given in binary integers.

RAOB - PART A

For Part A RAOBS, each level identified will be represented by 3 words as shown below. The surface level will be inserted so as to preserve a natural descending order of pressure; (e.g., the surface pressure is 950mb and data for the 1000mb level is also given. The surface level will be the second level in the output array).

Levels, other than the surface, which will be considered as possible Part A levels are the 1000, 850, 700, 600, 500, 400, 300, 250, 200, 150 and 100 mb levels.

If data for any element of a level is missing, all corresponding bits of the word will be turned on.

DATA WORD 1

PRESSURE	HEIGHT
18	18

PRESSURE - Given in tenths of a mb X 10.

HEIGHT - Given in whole meters.

DATA WORD 2

TEMPERATURE	DEWPOINT DEPRESSION
18	18

TEMPERATURE - Given in tenths of a degree Kelvin X 10.

DEWPOINT DEPRESSION - Given in tenths of a degree Kelvin X 10.

DATA WORD 3

0	WIND DIRECTION	WIND SPEED
18	9	9

WIND DIRECTION - Given in degrees true.

WIND SPEED - Given in meters per second.

Note: (1) For a calm report, both the wind direction and the wind speed will be set equal to zero.

(2) For a variable wind, the wind direction will be set = 99 (Octal 143).

Following the data words for the reporting mandatory levels, tropopause and/or maximum wind information may be expected. The number of trops is given in the control words. If none is indicated, no tropopause word will be carried. Two words will be carried for each tropopause level indicated. The format of these words is as given below:

TROP WORD 1

PRESSURE	WIND DIRECTION	WIND SPEED
18	9	9

PRESSURE - Given in tenths of a mb X 10.

WIND DIRECTION - Given in degrees true.

WIND SPEED - Given in meters per second. The note under Data Word 3 applies here also.

TROP WORD 2

TEMPERATURE	DEWPOINT DEPRESSION
18	18

TEMPERATURE - Given in tenths of a degree Kelvin X 10.

DEWPOINT DEPRESSION - Given in tenths of a degree Kelvin X 10.

If no tropopause data is available, maximum wind information will follow the data words. If none is present no max wind word will be carried.

The format of a max wind word is as given below. One word will be carried for each max wind indicated.

MAX WIND WORD

PRESSURE	WIND DIRECTION	WIND SPEED
18	9	9

PRESSURE - Given in tenths of a mb X 10.

WIND DIRECTION - Given in degrees true.

WIND SPEED - Given in meters per second. The note under Data Word 3 applies here also.

RAOB - PART B

For Part B RAOBS, the first two words following the control words will be reserved for surface information. If any surface element is missing (or if all surface elements are missing), the corresponding bits of the word will be set on. Each succeeding significant level will be represented by two words. If data for any level are missing, all corresponding bits of the word will be set on. The format of the two data words for each level is given below. The data will be output in the order in which it was received. No check will be made in pressure order.

DATA WORD 1

PRESSURE	WIND DIRECTION	WIND SPEED
18	9	9

PRESSURE - Given in tenths of a mb X 10.

WIND DIRECTION/WIND SPEED - Not normally given in Part B RAOBS. Ordinarily these 18 bits will be all set on. However, some stations report surface wind other than in the 21212 group. In this case, the wind direction (in degrees true) and the wind speed in meters per second will be given here. When a 21212 group is reported (and/or the 51515 group in WMO Region VI), it will be output as a Part B PIBAL. (see Part B PIBAL).

DATA WORD 2

TEMPERATURE	DEWPOINT DEPRESSION
18	18

TEMPERATURE - Given in tenths of a degree Kelvin X 10.

DEWPOINT DEPRESSION - Given in tenths of a degree Kelvin X 10.

The number of levels reported is carried in the control words (this will include the SFC level). Word count can therefore be used to position to the data word following the significant levels. If 250mb data is reported, this next word will be the first of the two words used for 250 mb data. If 250 mb data are carried, this will be indicated in the control words. Cloud data, if present, will always be carried as the final data word.

The 250mb format is as given above. However 250mb height data will be carried instead of pressure, and wind data will always be included. If the 250mb wind data is missing, all wind bits will be set on. The format for cloud data is given below. It conforms to the data base format, and is in Fieldata.

CLOUD WORD

7	Nh	Cl	h	Cm	Ch
6	6	6	6	6	6

7 - An indicator used to flag RAOB cloud information.

Nh, Cl, Cm, Ch - Data from the 41414 group as reported in the code.

RAOB - PART C

For Part C RAOBS, each level identified will be represented by the three data words shown in Part A.

Levels which will be considered as possible Part C levels are the 70, 50, 30, 20, 10, 7, 5, 3, 2 and 1 mb levels.

Tropopause and max winds will be handled as described for Part A RAOBS.

RAOB - PART D

Part D RAOBS will follow the description of Part B RAOBS, with the exception that no surface words will be reserved. Any 21212 will be output as a Part D PIBAL.

SLAMS

The data words for SLAMS will be output in the three word format shown for Part A RAOBs. The possible levels are: 850, 700, and 500 mb. Following the data words, mean wind and stability index information will be given in the same format as used in the data base; when these parameters are not reported, the respective data words will be omitted. The formats for these additional data words are given below:

MEAN WIND WORD

8	X	WIND DIRECTION	WIND SPEED
6	6	12	12

8 - An indicator denoting that this is mean wind data.

WIND DIRECTION - Given in degrees true.

WIND SPEED - Given in meters per second.

X - 1 if for the SFC-5000 ft layer; 2 if for the 5000-10000 ft layer.

STABILITY INDEX WORD

9	0	F	INDEX
6	18	1	11

9 - An indicator denoting stability index data.

F - Flag bit will always be zero to indicate that this is a reported stability index.

INDEX - The two digit code figure as reported.

RAOB OPTIONAL WORDS

THICKNESS/THERMAL WIND WORD

INDICATOR	THICK	THERMAL WIND DIRECTION	THERMAL WIND SPEED
6	12	9	9

INDICATOR - Identifies the word as a thickness/thermal wind word and identifies the layer for which the data are valid according to the following table:

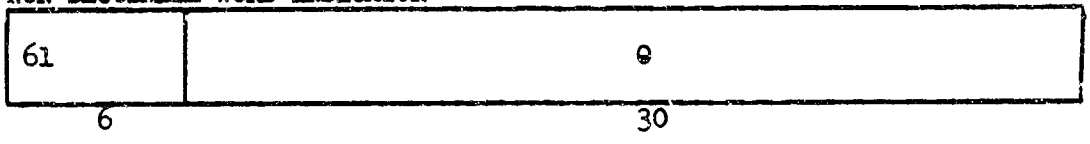
INDICATOR	LAYER
11	700 - 1000 mb
12	500 - 1000 mb
13	300 - 500 mb

THICKNESS - Given in dekameters.

THERMAL WIND DIRECTION - Given in degrees true.

THERMAL WIND SPEED - Given in meters per second.

NON-DECODABLE WORD INDICATOR



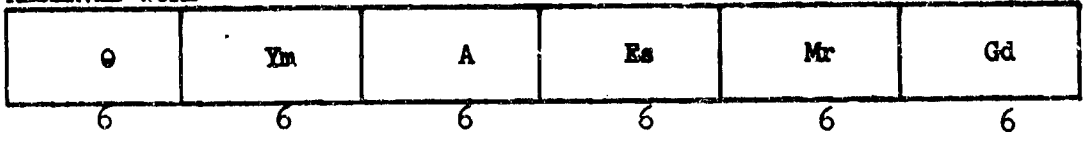
61 - The indicator for non-decodable RAOB (and SLAM) data.

If a report has been decoded for all expected elements, and more information follows, this information will be appended to the report in Fieldata, exactly as received, following the 61-indicator word. This provision will apply to any 51515-group not being decoded, and to any plain-language remark.

ROCKETSONDES (ROCOBS)

Each Rocketsonde report will carry three words for each reported level. If any data are missing for a reporting level, all corresponding bits will be set on. The format for Rocketsonde data words is given below. The format conforms to that used in the data base.

RESERVED WORD



Ym - Type of rocket motor (WMO Code 3644).

A - Reason for no report and ground equipment (WMO Code 0262).

Es - Type of data-sensing equipment (WMO Code 1051).

Mr - Method of reducing data (WMO Code 2649).

Gd - Estimated delay after scheduled launching until replacement rocket is fired (WMO Code 1334).

DATA WORD 1

10	0	WIND DIRECTION	WIND SPEED
6	6	12	12

10 - Indicator denoting rocketsonde data.

WIND DIRECTION - Given in degrees true.

WIND SPEED - Given in meters per second.

Note: For a calm report, both the wind direction and the speed will be set equal to zero. Variable directions are encoded as 99 (OCTAL 143).

DATA WORD 2

TEMPERATURE	HEIGHT
18	18

TEMPERATURE - Given in tenths of a degree Kelvin X 10.

HEIGHT - Given in whole kilometers.

DATA WORD 3

0	DP	DENSITY
12	6	18

DP - Decimal point locator as indicated in the code.

DENSITY - Given in grams per cubic meter X 10 exp (-DP), where DP is the decimal point locator.

ROCOB OPTIONAL WORD

NON-DECODABLE WORD INDICATOR

60	0
6	30

60 - The indicator for non-decodable ROCOB data. If a report has been decoded for all expected elements, and more information follows, this information will be appended to the report in Fieldata exactly as received, following the 60 - indicator word.

PIBAL DATA WORDS

Unless otherwise specified, all elements of the words will be given in binary integers.

PIBAL - PART A

For Part A PIBALS, each level identified will be represented by a word as shown below.

DATA WORD

PRESSURE	WIND DIRECTION	WIND SPEED
18	9	9

PRESSURE - Given in tenths of a mb X 10.

WIND DIRECTION - Given in degrees true.

WIND SPEED - Given in meters per second.

Note: For a calm report, both wind direction and wind speed will be set equal to zero; for a variable wind, the wind direction will be set equal to 99 (OCTAL 143).

Following the data words, maximum wind information may be expected. The number of max winds is given in the Control Words. If none is present, no max wind word will be carried. One word is carried for each max wind reported (units of max wind level specified in control words).

MAX WIND WORD

PRESSURE/HEIGHT	WIND DIRECTION	WIND SPEED
18	9	9

PRESSURE/HEIGHT - Either may be stored, depending on which is reported.

HEIGHT - Given in whole meters.

WIND DIRECTION and WIND SPEED - Units as given for the PIBAL data word above.

PIBAL - PART B

For Part B PIBALS, the first word following the control words will be reserved for surface data. The format of this data word is shown below. If the surface data are missing, this word will have all bits set on. Each succeeding significant level will be represented by one word (format same as for surface data). Chinese sometimes report max wind in Part B (sig) reports; when this happens, the max wind bits in CONTROL WORD 8 will be set and this wind output as the last wind in the array. No attempt will be made to sequence levels into proper order. The levels coded in successive indicator groups will be output as received.

DATA WORD

PRESSURE/HEIGHT	WIND DIRECTION	WIND SPEED
18	9	9

Note 1: In the code, $9t_nu_1u_2u_3$, $u_1u_2u_3$ must be in the proper order. If they are not, a word with all bits set on will be output to note the missing levels, and the data for these levels will be discarded. No attempt will be made to check the order of the t_n groups.

Note 2: For significant levels following a 21212-group, pressures will be output as received with no attempt to sequence into proper order. However, the indicators (NN) must be in order. If not, a

word with all bits set on will be output to note that levels are out of order, and the data for these levels will be discarded.

Note 3: If the discard of data mentioned in notes 1 and 2 above proves significant, more extensive programming can be expanded at a later date to salvage some of the data being discarded.

Note 4: If a wind fails the gross check or is all slashes in the code, but a height is available, the height will be stored; the missing indicator will be stored for the wind data. Data words for out-of-order groups are replaced by a single word with all bits set.

Note 5: Significant winds may be reported by height or pressure level. Units information is available in the Control Words.

Note 6: 21212-groups Part B RAOB reports will be output as a Part B PIBAL. In WMO Region VI the 51515-group winds will be sequenced with 21212 winds.

PIBAL - PART C

For Part C PIBALS, each level identified will be represented by the data word described in Part A PIBALS. Max wind levels will be handled as described in Part A PIBALS.

PIBAL - PART D

Part D PIBALS will be output as described in Part B PIBALS.

PIBAL - OPTIONAL WORDS

THERM WIND INDICATOR	ALL BITS ON	THERMAL WIND DIRECTION	THERMAL WIND SPEED
6	12	9	9

THERM WIND INDICATOR - Identifies the word as a thermal wind word and also identifies the layer according to the following table:

INDICATOR	LAYER
11	700 - 1000 mb
12	500 - 1000 mb
13	300 - 500 mb

THERMAL WIND DIRECTION - Given in degrees true.

THERMAL WIND SPEED - Will be given in meters per second.

Note: All bits will be set on in the 12 bits indicated in the diagram above. The word is similar to the thickness/thermal wind word for RAOBS. To carry a strict analogy, thickness is represented as missing.

OPTIONAL WORD 2

62 - Indicator for non-decodable PIBAL data. If a report has been decoded for all expected elements and more information follows, this information will be appended to the report in Fieldata exactly as it is received, following the 62 - Indicator word.

NON - DECODABLE REPORTS

All non-decodable reports will be placed in a no-decode file. These reports can then be printed for use by the monitoring analyst and for quality control post analyses.

APPENDIX C

AIRCRAFT 1108 DATA CONTROL WORDS

Unless otherwise specified, all elements of words will be given in binary integers.

CONTROL WORD 1

JULIAN HOUR	TYPE OF REPORT	GWC REGION	0	A
18	6	10	1	1

JULIAN HOUR - Report Time (the minutes of the report will be saved in CONTROL WORD 3).

TYPE OF REPORT - Set equal to 8 for all aircraft reports except non-decoded MAC AIREPS received via AUTODIN and plain language SAC low-level reports. For SAC low-level, plain language reports, TYPE OF REPORT is set equal tc 9. These reports will be output with only two control words: CONTROL WORD 1 and CONTROL WORD 3. The content is as follows:

CONTROL WORD 1 -

JULIAN HOUR - bulletin heading time

GWC REGION - zero-filled

CONTROL WORD 3 -

WORD COUNT - control word count plus data word count

MIN - bulletin heading minutes

AIRCRAFT FLIGHT ALTITUDE - zero filled

The report will follow the two control words, in Fieldata, as received. This type of report will be output to a special drum file, accessable by AFGWC forecasters. For non-decoded MAC AIREPS received via autodin, TYPE OF REPORT is set equal to 15. Seven control words are passed to the "Data Status" program by the Validation Program for aircraft reports. A code value indicating the reason the report could not be decoded replaces

GWC REGION, according to the following table:

100 - time missing or garbled

101 - position missing or garbled

102 - height missing or garbled

103 - position report (no data)

104 - garbled format

GWC REGION - Obtained from a systems routine with latitude/longitude as arguments.

A - Wind Units (0 = MPS, 1 = Knots).

CONTROL WORD 2

LATITUDE	LONGITUDE	KIND
15	16	5

LATITUDE/LONGITUDE - Will be output in units of hundredths of degrees X 100. Negative latitude (south) and longitude (east) will be stored as negative numbers.

KIND - (Code figures have been selected for sequencing order; i.e., for any one position and time, the most reliable and complete report will head the list).

17 - AWS RECCO - Published tracks and routes

18 - OTHER RECCO

19 - COMBAR

20 - MAC ABBREVIATED

21 - CODAR

22 - ICAO

23 - SAC LOW-LEVEL AIREP

24 - PLAIN LANGUAGE AIREP

Note: Code figures 23 and 24 will not be used until a plain-language capability has been developed.

CONTROL WORD 3

WORD COUNT	MIN	AIRCRAFT FLIGHT ALTITUDE
12	6	18

WORD COUNT - Control words plus data words.

MIN - Minutes of Report (saved because Julian-hour is rounded).

AIRCRAFT FLIGHT ALTITUDE - Height of aircraft in units of whole meters above sea level. If the aircraft reports its level by pressure level, aircraft flight altitude will be zero-filled, and the pressure level will be given in CONTROL WORD 5.

CONTROL WORD 4

RCPT TIME-OFF	RCPT TIME-FWH (H.S.)	RCPT TIME-HW, FU, FWH (LOW)
12	12	12

This word is a control word attached to each U/A raw-data bulletin by the message handler and is for data survey purposes. The decode program will pass this word on to the checking program.

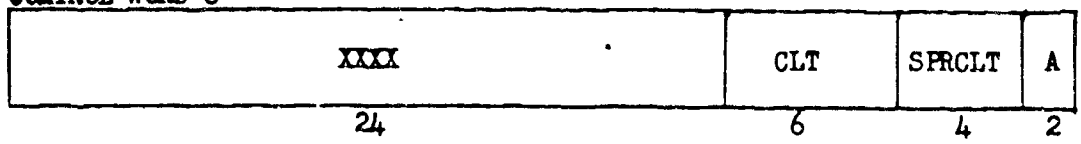
CONTROL WORD 5

MANOP NUMBER	AIRCRAFT PRESSURE LEVEL
18	18

MANOP NUMBER - Received on the AWN.

AIRCRAFT PRESSURE LEVEL - Except for CODAR reports and RECCO reports, this will always be zero-filled. (a) CODAR always reports their altitude by pressure level in whole mbs. (b) RECCO sometimes reports the altitude of a standard pressure level, which will be given here; the altitude of this level will be given in MANDATORY WORD 4 (See Appendix 10).

CONTROL WORD 6



XXXX - Second word of bulletin heading originator; e.g., KSFO, KJFK, KLFI, etc. (in Fieldata).

CLT - Hardware circuit (this information is passed from the message handler via CONTROL WORD 2 of the raw bulletin).

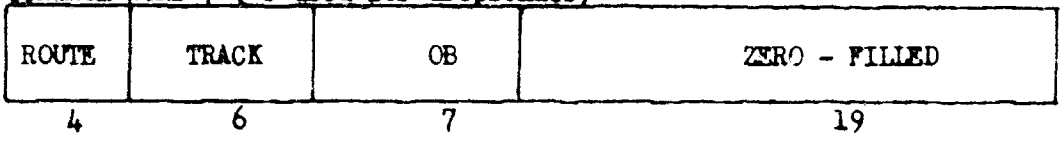
A - Data Insertion:

00 = Real data received via the AWN.
10 = Real data, manually inserted.
11 = Synthetic data, manually inserted.

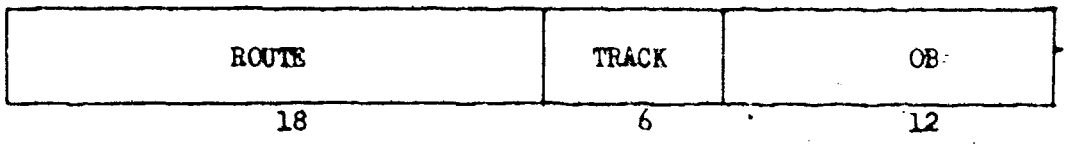
SPR CLT - 0 = Offutt
1 = Fuchu
2 = High Wycombe
3 = (not used)
4 = Monterey
5 = Carswell
6 = Clark

This information is passed from the message handler via CONTROL WORD 2 of the raw bulletin.

CONTROL WORD 7 (As used for dropsondes)



CONTROL WORD 7 (As used for AWS RECCO "horizontal" reports)



Note: CONTROL WORD 7 format varies with the type of report. All entries, except those for dropsonde reports, are in Fieldata.

(1) AWS RECCO and dropsonde reports - CONTROL WORD 7 includes route,

track and observation number (in Fieldata for AWS RECCO and binary for dropsondes). Routes are designated as follows:

ROUTE	AWS RECCO ENTRY	DROPSONDE ENTRY
GULL	GUL	1
LARK	LAR	2
LOON	LOO	3
ROBIN	ROB	4
SNIPE	SNI	5
STORK	STO	6
SWAN	SWA	7

TRACK	AWS RECCO ENTRY	DROPSONDE ENTRY
Alfa	A	1
Bravo	B	2
Charlie	C	3
Delta	D	4
Echo	E	5
Foxtrot	F	6
Golf	G	7
Hotel	H	8
India	I	9
Juliett	J	10
Kilo	K	11
Lima	L	12
Mike	M	13
November	N	14
Oscar	O	15
Papa	P	16
Quebec	Q	17
Special (SPL)	S	18

OB - observation number (Fieldata AWS RECCO; binary dropsonde).

(2) Other RECCO - CONTROL WORD 7 will be blank-filled.

(3) COMBAR - Filled with Fieldata zeroes (606060606060).

(4) MAC ABBREVIATED - Usually identified by a 3-or 5-digit tail number. This number will be left adjusted with right blank-fill. If this number is garbled or missing, the identifier word will be blank filled.

(5) CODAR - Filled with Fieldata zeroes (606060606060).

(6) ICAO— Usually identified by 3 to 6 Alpha-Numeric characters, designating airline and tail number. These characters will be left adjusted with right blank-fill. Occasionally, 7 Alpha-Numeric characters are used to identify the report. In this case, only the left-most 6 characters will be output. If this identifier is garbled or missing, the identifier word will be blank-filled.

(7) SAC LOW-LEVEL PIREP - To be determined when a plain-language decode capability has been developed.

(8) PLAIN LANGUAGE PIREP - See (7) above.

Data words will follow these 7 control words in the same format published for the data base.

Note: Until a plain-language capability has been developed, plain language remarks will be added to the decoded output. These remarks will follow an indicator word as indicated below:

NON-DECODABLE INDICATOR WORD

63	ZERO-FILLED
6	30

63 - Indicator reserved for non-decodable aircraft data (i.e., remarks following normal, published data groups).

Non-decodable words will follow in Fieldata characters, exactly as they are received. Non-decodable reports will be placed on a special area of the drum and will be routinely printed for use of the monitoring analyst and for post-analyses.

APPENDIX 10

AIRCRAFT DATA WORDS

Tables mentioned herein may be found at the end of this Appendix.

MANDATORY WORD 1

WIND RELIABILITY	WIND TYPE	WIND DIRECTION	WIND SPEED
6	6	12	12

WIND RELIABILITY - Given only in RECCO reports and will be a distinct number, according to RECCO CODE TABLE 8. For all other codes, 077 will be used.

WIND TYPE - Represents the method by which the wind was determined and will be a distinct number, according to RECCO CODE TABLE 7. Excerpts are for the readers convenience:

WIND TYPE = 0, spot wind over a specific location (For COMBAR, A = Doppler and Radar).

WIND TYPE = 1, midpoint wind over a specified distance (For COMBAR, B = fix-to-fix using visual, radar, celestial or loran fixes, and C = other).

WIND DIRECTION - Given in degrees true.

WIND SPEED - Given in meters per second.

Note: For a report of calm winds, both the wind direction and wind speed will be set equal to zero. Variable wind directions are encoded as 99.

MANDATORY WORD 2

PRESSURE LEVEL ASSIGNMENT	USABILITY OF AR	D-VALUE
12	6	18

PRESSURE LEVEL ASSIGNMENT - Mandatory pressure level to which the aircraft report is assigned (whole millibars). The conversion from aircraft flight altitudes to mandatory pressure levels is given in Table 3 of this Appendix (for CODAR reports, see remarks in Table 3).

Pressure level assignment will be made by the checking program.

USABILITY OF AR - As reported in COMBARs (encoded as 63 if garbled or missing). SH Value (0,2,4, or 6) from CODAR will be placed here.

D-VALUE - Departure in whole meters of the true altitude above mean sea level from the pressure altitude of the same point in space. Negative D-Values will be stored as negative numbers.

MANDATORY WORD 3

FLIGHT LEVEL TEMPERATURE	FLIGHT LEVEL D.P. DEPRESSION
18	18

FLIGHT LEVEL TEMPERATURE AND FLIGHT LEVEL D.P. DEPRESSION - Given in units of tenths of a degree Kelvin X 10 (i.e., 2538 = 253.8°K; 36 = 3.6°K).

MANDATORY WORD 4

HEIGHT OF MANDATORY PRESSURE LEVEL	TURBULENCE FREQUENCY	TURBULENCE INTENSITY	TURBULENCE TYPE
18	6	6	6

HEIGHT OF MANDATORY PRESSURE LEVEL - Reported only in RECCO reports (RECCO Code Table 11).

TURBULENCE FREQUENCY - Will be a distinct number, according to Table 4.

TURBULENCE INTENSITY - Will be a distinct number according to Table 5.

TURBULENCE TYPE - Will be a distinct number according to Table 6.

ADDITIONAL DATA WORDS. Unless otherwise specified, all elements of words will be given in binary integers. With the exception of the first, the additional words are optional and will be included in the aircraft report only when the additional data are available.

TABLE OF INDICATORS. Each additional data word contains an indicator in the left-most bits. These indicators are used to facilitate searching for specific information given in the additional data words. In addition, they provide a convenient means for the addition or deletion

of additional data to the aircraft report.

TABLE OF INDICATORS

Code Figure	Type of Information
0	Not used
1	Additional data word count
2	Cloud and contrail data
3	Icing data
4	In-flight and off-course data
5	Surface data
6	Radar data
7	Miscellaneous data
8 - 62	Not used
63	Aircraft non-decodable data

WORD FOR ADDITIONAL DATA WORD COUNT

1	0	ADDITIONAL DATA WORD COUNT	NON-DECODABLE WORD COUNT
6	12	9	9

ADDITIONAL DATA WORD COUNT - Provides information on the number of additional data words in the complete aircraft report.

NON-DECODABLE WORD COUNT - Provides information on the number of non-decodable words in the complete aircraft report.

CLOUD AND CONTRAIL DATA WORD

2	NUMBER OF CLOUD LAYERS	0	TYPE OF CONTRAILS	LOCATION OF CONTRAILS
6	6	12	6	6

NUMBER OF CLOUD LAYERS - Number of cloud layers reported. When zero, only contrail information is available.

TYPE OF CONTRAILS - Reported in RECCO and COMBAR reports (Table 7).

LOCATION OF CONTRAILS - Reported in COMBAR reports (Table 8).

SUPPLEMENTARY DATA WORD(s) FOR CLOUD DATA

CLOUD AMOUNT	CLOUD TYPE	CLOUD BASE	CLOUD TOP
6	6	12	12

CLOUD AMOUNT - Will be a distinct number, according to WMO Code 2700.

CLOUD TYPE - Will be a distinct number, according to WMO Code 0500. For missing or garbled reports, CLOUD TYPE will be set equal to 63 (Ø77); if the type is not reported, CLOUD TYPE will be set equal to 10 (Ø12).

CLOUD BASE and CLOUD TOP - Will be given in units of dekameters.

Note: One word will be included for each cloud layer reported in the preceding word; the layers will be reported in ascending height order.

ADDITIONAL DATA WORD(s) FOR ICING DATA

3	ICING SUPP	0	BEGIN ICING	END ICING	ICING RATE
6	6	6	6	6	6

ICING SUPP - Set to 1 if supplementary icing word follows; otherwise 0.

BEGIN ICING - Distance to beginning of icing (RECCO Code Table 19).

END ICING - Distance to end of icing (RECCO Code Table 19).

ICING RATE - Code given in Table 9.

SUPPLEMENTARY WORD FOR ICING DATA

TYPE OF ICING	BASE OF ICING	TOP OF ICING
12	12	12

TYPE OF ICING - See RECCO Code Table 22.

BASE OF ICING and TOP OF ICING - Given in whole dekameters (e.g., 1020 = 10200 meters).

IN-FLIGHT AND OFF-COURSE DATA WORD ONE

4	FLT WX SUPPLEMENT	FLIGHT CONDITION	FLIGHT VSBY	FLIGHT WEATHER	REMARKS
6	6	6	6	6	6

FLT WX SUPPLEMENT - Set to number of supplementary in-flight and off-course weather data word(s) following.

FLIGHT CONDITION - See Table 10.

FLIGHT VSBY - See Table 11.

FLIGHT WEATHER - See Table 12.

REMARKS - See RECCO Code Table 10.

SUPPLEMENTARY IN-FLIGHT AND OFF-COURSE DATA WORD(S)

WS	SS	WC	DW	SKY COVER	HEIGHT
6	6	6	6	6	6

WS - Significant changes in weather (RECCO Code Table 18).

SS - Distance of occurrence of significant changes in weather (RECCO Code Table 19).

WC - Off-course weather (RECCO Code Table 20).

DW - Bearing of off-course weather (RECCO Code Table 15).

SKY COVER - Data received in COMBARS (Table 13).

HEIGHT - Data received in COMBARS (Table 14).

Note: The number of supplementary words is always three for COMBARS, the three words giving the SKY COVER below, at and above flight level.

SURFACE DATA

5	DK	S	DD	FF
6	6	6	6	12

DK - Direction of swell (RECCO Code Table 15).

S - State of the sea (RECCO Code Table 17).

DD - Direction of the surface wind (in tens of degrees; i.e., 32 = 320°). In the event the wind direction is reported to 8 points of the compass, DD will be assigned values according to Table 15.

FF - Surface wind speed (knots). If the wind speed is reported according to RECCO Code Table 16, FF will be assigned code values.

RADAR DATA WORDS (either none or two)

6	DRDR	CE	I	OE
6	12	6	6	6

DRDR - Bearing of echo center from the aircraft (degrees true).

CE - Character of the echo (RECCO Code Table 24).

I - Intensity of the echo (RECCO Code Table 25).

OE - Orientation of the ellipse (RECCO Code Table 23).

SR	WE	AE
12	12	12

SR - Distance to the echo center (whole kilometers).

WE - Ellipse width or echo diameter (whole kilometers).

AE - Length of major axis (whole kilometers).

MISCELLANEOUS DATA (COMBAR or RECCO reports only)

7	SURFACE PRESSURE	ALTIMETER SUB-SCALE RDNG	AIRCRAFT HEADING
6	12	12	6

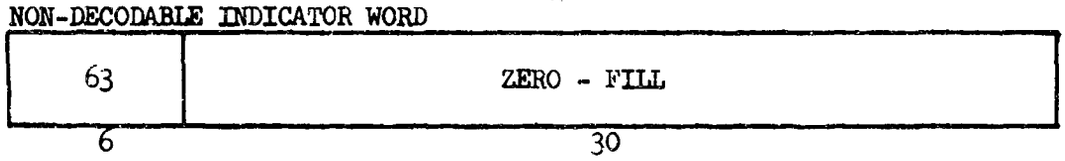
SURFACE PRESSURE - From RECCO reports (whole millibars).

ALTIMETER SUB-SCALE RDNG - From RECCO reports (whole millibars).

AIRCRAFT HEADING - From COMBAR reports (represents the magnetic direction in tens of degrees).

Note: Until a plain-language capability has been developed, plain language remarks will be added to the decoded output. These remarks will follow an indicator word as indicated below:

NON-DECODABLE INDICATOR WORD



63 - Indicator reserved for non-decodable aircraft data (i.e., remarks following normal published data groups).

NON-DECODABLE - Words will follow in Fieldata characters, exactly as they were received. Non-Decodable Reports will be placed on a special area of the drum and will be routinely printed for use of monitoring analyst and for post-analyses.

TABLES

Table 1. Type of Report.

Code Figure	Type of Report
0, 1	Reserved
2	Surface Hourly (includes record specials)
3	Surface Special (excludes record specials)
4	Surface I.D. report
5, 6	Reserved
7	Upper air report
8	Aircraft report
9 - 63	Not used

Table 2. Type of Aircraft Report.

Code Figure	Type
0	Not used
1	AWS RECCO
2	Other RECCO
3	COMBAR
4	MAC Abbreviated AIREP
5	WMO CODAR
6	ICAO AIREP
7	SAC Low Level PIREP
8	Plain Language PIREP
9 - 63	Not used

Table 3. Pressure Level Assignments.

Flt Alt (1000ft MSL)	Mand. Press. Lvl. (mb)
1 - 3	N/A
4 - 7	850

Flt Alt (1000 ft MSL)	Mand. Press. Lvl. (mb)
8 - 13	700
14	N/A
15 - 21	500
22 - 26	400
27 - 32	300
33 - 36	250
37 - 42	200
43 - 48	150
49 - 56	100
57 - 63	070
64 - 71	050
72 - 74	N/A
75 - 81	030
82 - 83	N/A
84 - 90	020
91 - 97	N/A
98 - 104	010

*For CODAR reports (flight level given in millibars), the pressure level assignment will be the nearest mandatory pressure level to the aircraft's flight level pressure.

Table 4. Frequency of Turbulence.

Code Figure	Frequency
0	Not reported
1	Infrequent
2	Frequent

Code Figure	Frequency
3	Occasional
4	Intermittent
5	Continuous
6 - 62	Not used
63	Missing or garbled

Table 5. Intensity of Turbulence.

Code Figure	Intensity
0	None
1	Light
2	Light-moderate
3	Moderate
4	Moderate-severe
5	Severe
6	Severe-extreme
7	Extreme
8	None reported(ICAO only)
9 - 62	Not used
63	Missing or garbled

Table 6. Type of Turbulence.

Code Figure	Type
0	Not reported
1	In clouds
2	Clear air turbulence
3 - 62	Not used
63	Missing or garbled

Table 7. Type of Contrails.

Code Figure	Type
0	None
1	Non-persistent
2	Persistent
3	Not reported
4 - 62	Not used
63	Missing or garbled

Table 8. Location of Contrails.

Code Figure	Location
0	Not reported
1	Above flight level
2	At flight level
3	Below flight level
4 - 62	Not used
63	Missing or garbled

Table 9. Rate of Icing.

Code Figure	Rate of Icing
0	0.1 inch or 2mm/minute
1	0.1-0.2 inch or 2-5 mm/minute
2	0.3-0.4 inch or 6-10 mm/minute
3	0.5-0.6 inch or 11-15 mm/minute
4	0.7-0.8 inch or 16-20 mm/minute
5	0.9-1.0 inch or 21-25 mm/minute
6	Over 1.0 inch or 25 mm/minute
7	Light
8	Moderate

Code Figure	Rate of Icing
9	Heavy (or severe)
10	None
11	Trace
12	Hail
13	No report available
14 - 62	Not used
63	Missing or garbled

Table 10. Flight Condition.

Code Figure	Description
0	Total amount of cloud less than 1/8
1	Total cloud amount at least 1/8, with either 1/8-4/8 above or 1/8-4/8, below or combinations thereof
2	Cloud amount more than 4/8 above and 0-4/8 below
3	Cloud amount 0-4/8 above and more than 4/8 below
4	Cloud amount more than 4/8 above and more than 4/8 below
5	Chaotic sky - many undefined layers
6	In and out of clouds; on instruments 25% of time
7	In and out of clouds; on instruments 50% of time
8	In and out of clouds; on instruments 75% of time

Code Figure	Description
9	In clouds all of the time; continuous instrument flight
10	Clear
11	Above clouds (tops less than 10000 ft)
12	Above clouds (tops 10-18000 ft)
13	Above clouds (tops above 18000 ft)
14	Below clouds (bases less than 10000 ft)
15	Below clouds (bases 10-18000 ft)
16	Below clouds (bases above 18000 ft)
17	Between broken or overcast layers
18	In clouds
19	In and out of clouds
20 - 62	Not used
63	Missing, garbled, or impossible to determine due to darkness

Table 11. Flight Visibility.

Code Figure	Visibility
0	Not used
1	Poor (less than 1 n.m.)
2	Fair (1-3 n.m.)
3	Good (greater than 3 n.m.)
4	Not reported
5 - 62	Not used
63	Missing or garbled

Table 12. Flight Weather.

Code Figure	Weather
0	Clear (no cloud at any level)
1	Partly cloudy (scattered or broken)
2	Continuous layer(s) of cloud(s)
3	Sandstorm, duststorm, or storm of drifting snow
4	Fog, thick dust, or haze
5	Drizzle
6	Rain
7	Snow or rain and snow mixed
8	Shower(s)
9	Thunderstorm(s)
10	Lightning
11	Scattered clouds
12	Broken clouds
13 - 62	Not used
63	Missing or garbled

Table 13. Sky Coverage Data (COMBAR).

Code Figure	Coverage
0	Clear
1	Scattered
2	Broken
3	Overcast
4 - 62	Not used
63	Unknown or missing or garbled

Table 14. Height.

Code Figure	Height
0	Below flight level
1	At flight level
2	Above flight level
3 - 62	Not used
63	Missing or garbled

Table 15. Wind Direction Assignment.

Code Figure	Direction	Assignment
0	Calm	00
1	NE	05
2	E	09
3	SE	14
4	S	18
5	SW	23
6	W	27
7	NW	32
8	N	36
9	-	63

Table 16. Wind Speed Assignment.

Code Figure	Reported Speed (kts)	Assignment (kts)
0	Calm	0
1	1 - 3	2
2	4 - 6	5
3	7 - 10	9
4	11 - 16	14
5	17 - 21	19
6	22 - 27	25

Code Figure	Reported Speed (kts)	Assignment (kts)
7	28 - 33	31
8	34 - 40	37
9	41 - 47	44

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY *(Corporate author)*
UNITED STATES AIR FORCE
AIR FORCE GLOBAL WEATHER CENTRAL
OFFUTT AFB NE 68113

2a. REPORT SECURITY CLASSIFICATION
UNCLASSIFIED

2b. GROUP

3. REPORT TITLE
AFGWC AUTOMATED METEOROLOGICAL DATA PROCESSING

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

5. AUTHOR(S) *(First name, middle initial, last name)*
Richard K. Wilson, Lt Col, USAF

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
15 September 1970	84	

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
N/A b. PROJECT NO.	AFGWCTM 70-6
c. d.	9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)* N/A

10. DISTRIBUTION STATEMENT
Distribution of this document is unlimited

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
N/A	Air Force Global Weather Central Offutt AFB NE 68113

13. ABSTRACT

The present "state of the art" in automated meteorological data processing as practiced at Air Force Global Weather Central is discussed. This includes major activities from interface with the Department of Defense operated Automated Weather Network (AWN) to the storage of individual reports into the AFGWC data base prior to scientific validity checks. Only the meteorological data processing or decoding of conventional weather reports is discussed. A description of scientific validation of these reports is not included. Computer storage formats for each type of data are shown.

DD FORM 1 NOV 68 1473

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Security Classification

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Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
DATAPROCESSING						
METEOROLOGICAL DATA						
DECODING						
WEATHER REPORTS						
AUTOMATED WEATHER NETWORK						
MESSAGE FORMATS						
CODE TRANSLATION						
DATA BASE FORMATS						
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